PlanInspector

Analyzing MSSQL query plans

An overview of the PowerShell scripts and usage

Why?

One of the most important actions when a performance issue occurs, is to get precise understanding on the workload that is executing and how resource usage is being driven. For this, access to the actual execution plan is important.

https://learn.microsoft.com/en-us/sql/relational-databases/performance/query-profiling-infrastructure?view=sql-server-ver16

About me

Bart Vernaillen

bart.vernaillen@d-bart.com

20 + years experience with:

- SQL Server
- PowerShell enthusiast

Slides:

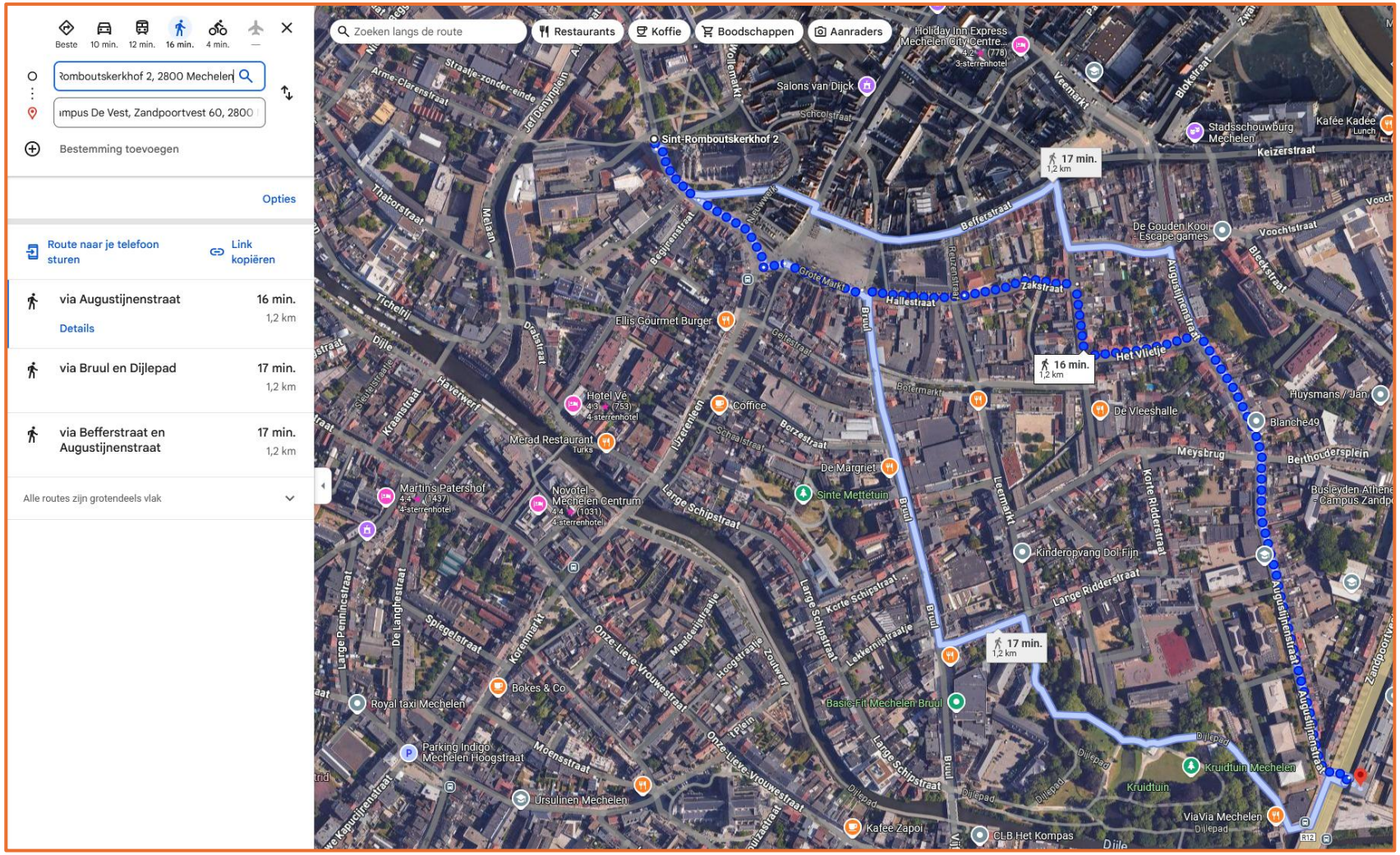
https://github.com/D-BArt-com/PlanInspector

Session goals

- Demo the code ☑
- Analyze data to uncover performance issues ☑
- Solve issues ☒

Why is a query plan created?

- TSQL declarative language
- You set the goal (query)
- Routes are evaluated
- Choose ‘cheapest’ route



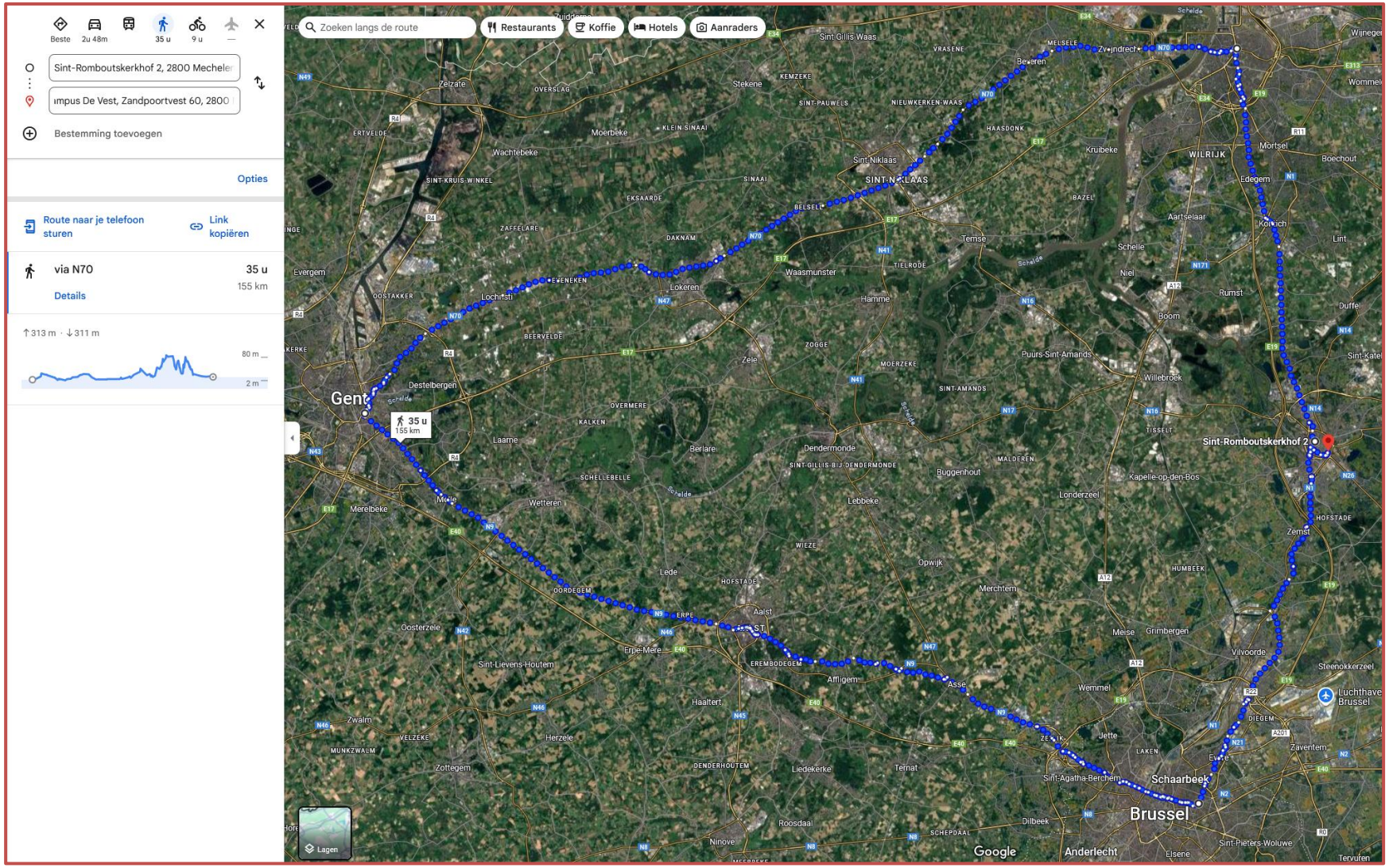
The goal of the optimizer is:

- Find a good plan quickly
- Execute the query fast
- Minimize resource usage during query execution

The goal isn’t:

- Explore every possible option
- Create the best possible plan

But sometimes things go wrong.



PlanInspector process

Capture plans with XE

- Lightweight query profiling infrastructure
  - Sqlserver.query_post_execution_plan_profile
    - Wait statistics ☒
    - CPU uasage ☒
- Store plans in .XEL files to minimize server impact

https://learn.microsoft.com/en-us/sql/relational-databases/performance/query-profiling-infrastructure?view=sql-server-ver16

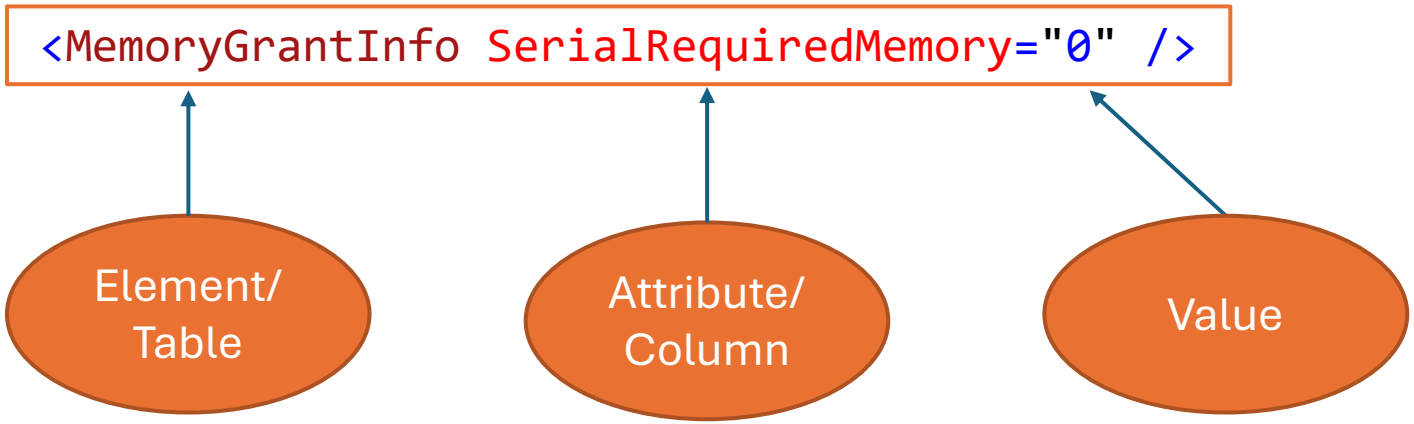
The query plan XML

Wikipedia definition

Extensible Markup Language (XML) is a markup language and file format for storing, transmitting, and reconstructing data. It defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.

```
<?xml version="1.0" encoding="utf-16"?>
<ShowPlanXML xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xsd="http://www.w3.org/2001/XMLSchema" Version="1.564" Build="16.0.4155.4"
  <BatchSequence>
    <Batch>
      <Statements>
        <StmtSimple StatementCompId="1" StatementEstRows="1000" StatementId="1" StatementOptmLevel="TRIVIAL" CardinalityEstimationModelVersion="160
          <StatementSetOptions ANSI_NULLS="true" ANSI_PADDING="true" ANSI_WARNINGS="true" ARITHABORT="true" CONCAT_NULL_YIELDS_NULL="true" NUMERIC_
          <QueryPlan DegreeOfParallelism="1" CachedPlanSize="24" CompileTime="1" CompileCPU="1" CompileMemory="176">
            <MemoryGrantInfo SerialRequiredMemory="0" SerialDesiredMemory="0" GrantedMemory="0" MaxUsedMemory="0" />
            <OptimizerHardwareDependentProperties EstimatedAvailableMemoryGrant="307200" EstimatedPagesCached="307200" EstimatedAvailableDegreeOfPa
            <WaitStats>
              <Wait WaitType="ASYNC_NETWORK_IO" WaitTimeMs="84" WaitCount="98" />
              <Wait WaitType="MEMORY_ALLOCATION_EXT" WaitTimeMs="2" WaitCount="4913" />
            </WaitStats>
            <QueryTimeStats CpuTime="17" ElapsedTime="101" />
            <RelOp AvgRowSize="8277" EstimateCPU="0.0001" EstimateIO="0" EstimateRebinds="0" EstimateRewinds="0" EstimatedExecutionMode="Row" Estim
              <OutputList>
                <ColumnReference Database="[AdventureWorks2017]" Schema="[Person]" Table="[Person]" Column="BusinessEntityID" />
                <ColumnReference Database="[AdventureWorks2017]" Schema="[Person]" Table="[Person]" Column="PersonType" />
                <ColumnReference Database="[AdventureWorks2017]" Schema="[Person]" Table="[Person]" Column="NameStyle" />
                <ColumnReference Database="[AdventureWorks2017]" Schema="[Person]" Table="[Person]" Column="Title" />
                <ColumnReference Database="[AdventureWorks2017]" Schema="[Person]" Table="[Person]" Column="FirstName" />
                <ColumnReference Database="[AdventureWorks2017]" Schema="[Person]" Table="[Person]" Column="MiddleName" />
                <ColumnReference Database="[AdventureWorks2017]" Schema="[Person]" Table="[Person]" Column="LastName" />
                <ColumnReference Database="[AdventureWorks2017]" Schema="[Person]" Table="[Person]" Column="Suffix" />
                <ColumnReference Database="[AdventureWorks2017]" Schema="[Person]" Table="[Person]" Column="EmailPromotion" />
                <ColumnReference Database="[AdventureWorks2017]" Schema="[Person]" Table="[Person]" Column="AdditionalContactInfo" />
                <ColumnReference Database="[AdventureWorks2017]" Schema="[Person]" Table="[Person]" Column="Demographics" />
                <ColumnReference Database="[AdventureWorks2017]" Schema="[Person]" Table="[Person]" Column="rowguid" />
                <ColumnReference Database="[AdventureWorks2017]" Schema="[Person]" Table="[Person]" Column="ModifiedDate" />
              </OutputList>
              <RunTimeInformation>
                <RunTimeCountersPerThread Thread="0" ActualRows="1000" Batches="0" ActualEndOfScans="1" ActualExecutions="1" ActualExecutionMode="R
              </RunTimeInformation>
              <Top RowCount="false" IsPercent="false" WithTies="false">
```

Elements and Attributes



XML Schema definition

- Defines the structure of the XML

https://schemas.microsoft.com/sqlserver/2004/07/showplan/

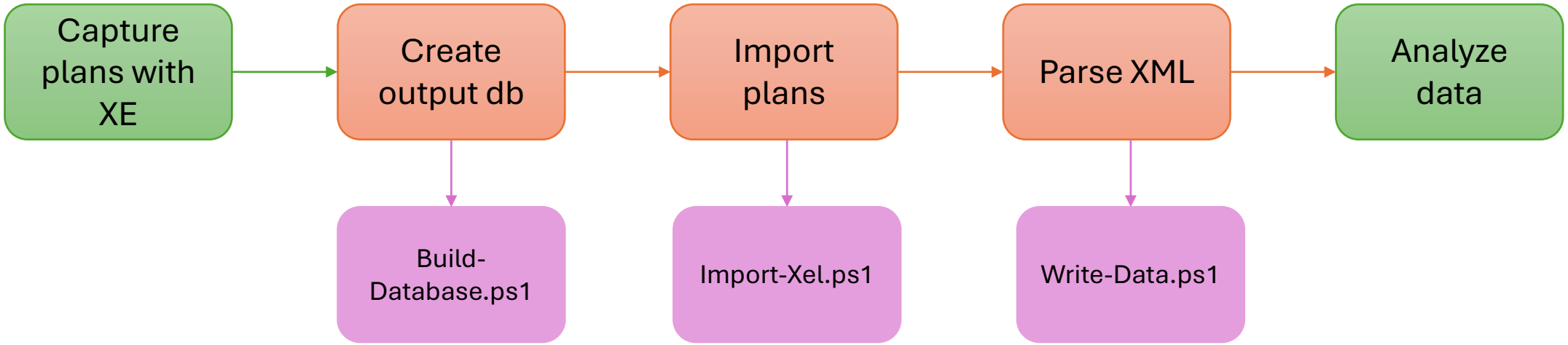
XML Schema definition

```
<MemoryGrantInfo SerialRequiredMemory="0" />
```

```
<xsd:element name="MemoryGrantInfo" type="shp:MemoryGrantType" minOccurs="0" maxOccurs="1"/>
```

```
-<xsd:complexType name="MemoryGrantType">
  -<xsd:annotation>
    +<xsd:documentation></xsd:documentation>
   </xsd:annotation>
   <xsd:sequence/>
   <xsd:attribute name="SerialRequiredMemory" type="xsd:unsignedLong" use="required"/>
   <xsd:attribute name="SerialDesiredMemory" type="xsd:unsignedLong" use="required"/>
   <xsd:attribute name="RequiredMemory" type="xsd:unsignedLong" use="optional"/>
   <xsd:attribute name="DesiredMemory" type="xsd:unsignedLong" use="optional"/>
   <xsd:attribute name="RequestedMemory" type="xsd:unsignedLong" use="optional"/>
   <xsd:attribute name="GrantWaitTime" type="xsd:unsignedLong" use="optional"/>
   <xsd:attribute name="GrantedMemory" type="xsd:unsignedLong" use="optional"/>
   <xsd:attribute name="MaxUsedMemory" type="xsd:unsignedLong" use="optional"/>
   <xsd:attribute name="MaxQueryMemory" type="xsd:unsignedLong" use="optional"/>
   <xsd:attribute name="LastRequestedMemory" type="xsd:unsignedLong" use="optional"/>
   <xsd:attribute name="IsMemoryGrantFeedbackAdjusted" type="shp:MemoryGrantFeedbackInfoType" use="optional"/>
 </xsd:complexType>
```

PlanInspector process



Why PowerShell?

- Performance!!!
- Much faster than TSQL
  - Extracting ‘Relop’ info with T-SQL 30 seconds

00:00:30	7,103 rows

  - Extracting all data with PowerShell < 4 seconds

```
Start Write-Data.ps1
End Write-Data.ps1
Script duration: 3.2479591
```

Demo time

Slides:

https://github.com/D-BArt-com/PlanInspector